



Publication: 203011-20K

Issue Date: December 1990

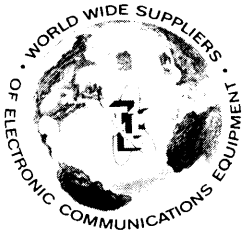
TECHNICAL MANUAL

for

Transmitting Antenna Coupler

Model TRC-20K

The Technical Materiel Corporation
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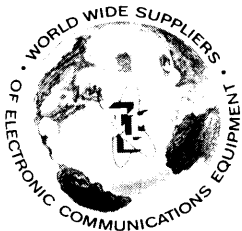
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THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS



PLEASE READ THIS FIRST

Dear **TMC** product user:

Thank you for purchasing the TMC Model TRC-20K Transmitting Antenna Coupler. This model is one of a series of four different types that provide balanced-to-unbalanced coupling of transmitters or transceivers to antenna systems. The complete series operate in the 2 to 30MHz frequency range at power ratings from 500 watts to 50,000 watts.

The antenna coupler, or BALUN as it is frequently called, is described in detail in the enclosed technical manual. This publication provides important information about using TMC equipment. Please read it.

Since the TRC-20K requires mating connectors and coaxial cables to operate properly, a catalog on TMC's connector products is included. If you need additional data or some specific technical information, please give our Customer Service a call at (914) 698-4800 or return the business reply form provided in this package. Our FAX (facsimilie) number is (914) 698-4805 and our telex number is 137-358 TECH-MAT MECK.

If you are missing any items, please contact TMC directly or through your local TMC sales office.

Thank you for selecting the TMC Model TRC-20K antenna coupler.

The Technical Materiel Corporation
Product Marketing

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS

What does TMC do?

The Company

The Technical Materiel Corporation (TMC) is engaged in the business of communications engineering. Simply stated, we make it possible for people and machines to communicate with one another by planning, creating and combining equipment to provide complete facilities for modern communications. We accomplish this with people, working at various TMC locations worldwide.

Our line of over 400 products range from the basic assemblies used in RF transmission to the complex systems used in computer command and control. Designed to carry data, facsimile, video and voice throughout the world, these products include -

- Communication Systems
- Transceivers
- Transmitters
- Receivers
- RF Antenna Couplers
- Security Equipment
- Remote Control Systems
- Computer Hardware/Software
- RF/Digital Connectors
- Patch Panels
- Audio/FSK Products
- Tools and Test Equipment

Since 1947, when TMC was first organized as a supplier of electronic equipment to the U.S. Armed Forces, the focus of the company has been on providing customers throughout the world with the type of equipment they need to communicate. Our customers include commercial users, both U.S. and foreign governments, and civil defense agencies. Today, TMC equipment is found in 140 countries on five continents. It is so reliable that we still support operating equipment built in TMC plants over 30 years ago.

Engineering

TMC invests in the future of its customers by constantly upgrading its product line with new materials and techniques. Our engineering staff has a dual purpose: support the customer in the field and develop new products to meet that customer's changing needs. This ongoing effort has created a loyal following among professionals worldwide as well as an extensive product line backed by broad technical expertise in modern communications.

The technical products engineered by TMC satisfy real customer needs. They are designed for use by practical engineers and technicians operating large communications installations. These products and services provide customers with the greatest possible value. As a result, TMC has gained a solid reputation as a supplier of practical communications products that operate reliably at low cost over long periods of time.

Quality

Only the finest workmanship goes into the design and manufacture of TMC products. There is no compromise here. Our equipment is designed to last for many years. We build in to the assembly process many tests that detect flaws in the product. Before any product leaves the factory, all flaws are corrected - otherwise, the product never gets into the field. Our success in achieving zero-defect quality is measured by the long list of customers who have repeatedly come back to TMC over the decades. It is this respect and loyalty that assures our customers are always offered the best in modern equipment designs for their communications needs.

Customer Support

Our sale never ends with delivery of equipment to a customer. We maintain a staff of electronic and mechanical engineers, all with many years of experience, who travel to outlying sites to maintain and install our equipment. They also train technicians "on the job" in correct procedures so that equipment is assured a long, trouble-free life.

Closer to home, the **engineering services** TMC offers cover the full spectrum of support for the complex and varied products operating in the field. These services include -

- System Engineering
- Software Development
- Service and Installation
- Assembly and Test
- Packaging
- Program Management
- Publications
- Site Preparation and Design
- Spare Parts Support
- System Integration
- Network Design
- Training

Customer support, however, goes beyond these services. There are the people at TMC - a telephone call away from answering any question - technical or otherwise. There is the TMCommunicator newsletter which keeps users of TMC products advised of the latest developments in modern equipment design. There is the computer call-in service which allows users to enter inquiries directly into an on-line computer database for a 24-hour response. There are the product bulletins, the technical manuals, the application notes, the field service notes - all the support you need to do an effective job with TMC products.

THE CONTENTS AND INFORMATION CONTAINED IN THIS INSTRUCTION MANUAL IS PROPRIETARY TO THE TECHNICAL MATERIEL CORPORATION TO BE USED AS A GUIDE TO THE OPERATION AND MAINTENANCE OF THE EQUIPMENT FOR WHICH THE MANUAL IS ISSUED AND MAY NOT BE DUPLICATED EITHER IN WHOLE OR IN PART BY ANY MEANS WHATSOEVER WITHOUT THE WRITTEN CONSENT OF THE CORPORATION.

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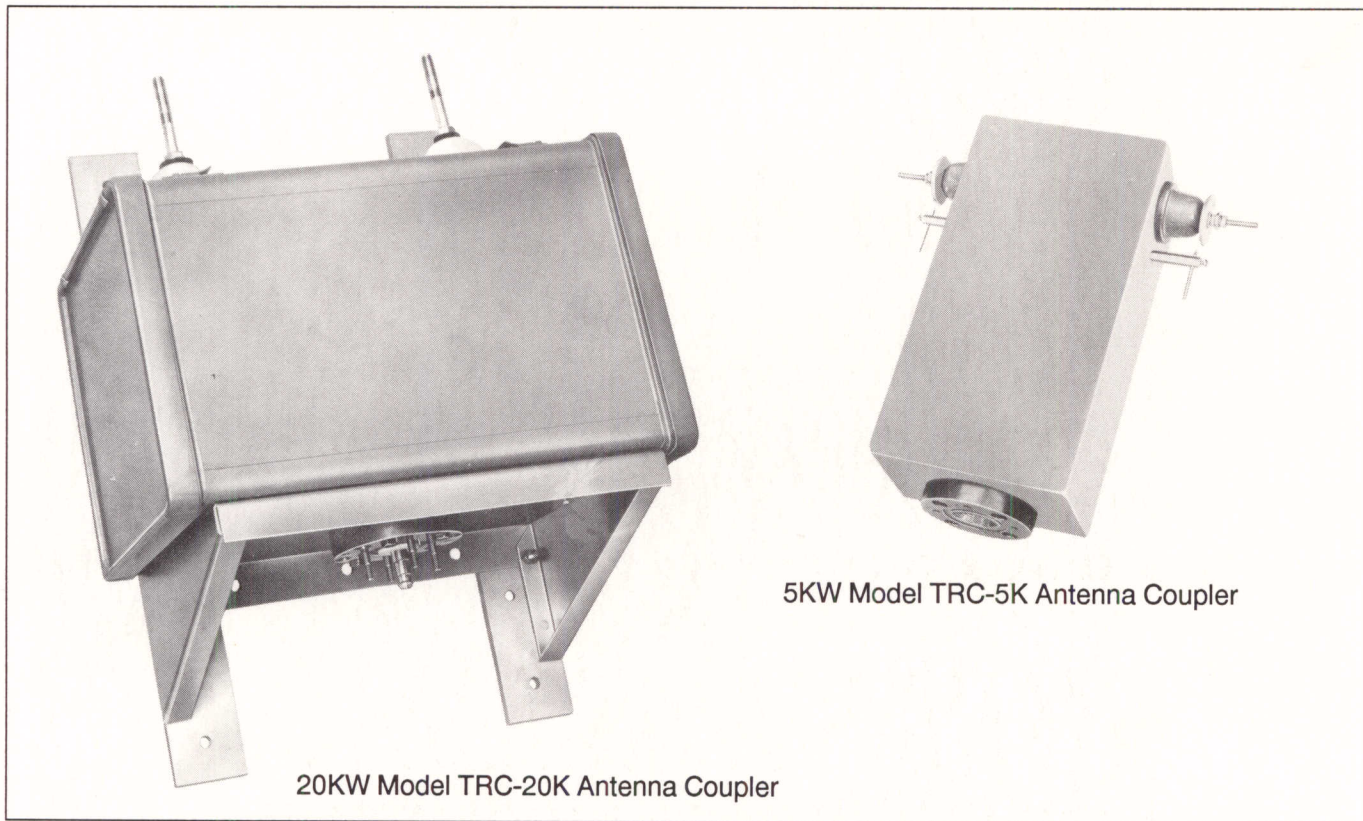
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The designation "TRC" is used herein to refer interchangeably with the TRC-20K.

Section 1 - General Description

1.1 Functional Description

1.1.1 Overview

The TRC-20K HF Transmitting Antenna Coupler is a broadband transformer coupling unit used for matching coaxial transmission lines to rhombic or other antenna systems requiring a 600-ohm impedance. Use of the TRC-20K at a transmitting facility will allow uniform coaxial transmission and coaxial antenna transfer by providing the proper impedance match at the transmitting antenna. The TRC-20K provides an efficient means of coupling to match RF impedances at power levels of 20,000 watts average or 40,000 watts PEP over the frequency range of 4 to 30MHz. It provides an insertion loss less than 1dB over this range.

1.1.2 Major Assemblies

The TRC coupler consists of one broadband transformer housed in a re-inforced fiberglass case for operation in any ambient environment from -50°C to +75°C. Spark gaps provide protection against static electricity on the antenna as well as lightning discharge. Mounts are provided for either pole or wall mounting. Since no maintenance is required, the coupler may be placed in any isolated area, such as an antenna farm. Outline and mounting dimensions of the TRC-20K are shown in Figures 2.2 and 2.3.

1.1.3 Input/Output Characteristics

Two basic models of the TRC-20K are available: a 50-ohm version used to match a 50-ohm unbalanced impedance to a 600-ohm balanced impedance and a 70-ohm version used to match a 70-ohm unbalanced impedance to a 600-ohm balanced impedance. The models are differentiated by an option number added to the TRC-20K designation. These options, listed in Section 1.4, reflect the type of unbalanced connector assembly used.

1.2 Physical Description

1.2.1 Equipment Mounting

The TRC-20K is designed for either pole or wall mounting. Two mounting straps with the necessary lag bolts are provided for pole mounting while wall mounting uses four mounting brackets fastened directly to the TRC case.

1.2.2 Balanced RF Connections

The balanced connectors consist of two Mycroy^R bowls mounted to the top of the coupler case. Standard threaded rods with stainless steel nuts and flat washers are used to secure the antenna feed lines.

1.2.3 Unbalanced RF Connections

Several unbalanced connectors are available for the TRC units and are mounted at the bottom of the TRC case. Although a standard 3-1/8 inch EIA flange assembly is normally provided, different choices are available depending on the antenna installation. Refer to Section 1.4 or the TMC Connector Products Catalog for other connector assemblies.

1.3 Technical Specifications

Frequency Range 4 - 30 MHz

Insertion Loss Less than 1dB over operating range.

RF Power Rating 40KW PEP/20KW Avg. 100KW PEP on a 20% duty cycle.

Impedance Matching Capability

For 50-ohm operation: 50 ohms unbalanced to 600 ohms balanced.

For 70-ohm operation: 70 ohms unbalanced to 600 ohms balanced.

RF Fittings - Unbalanced Coaxial

3-1/8 inch EIA Flange standard. Optional adapter/reducer assemblies with others available depending on application. (See chart Section 1.4)

RF Fittings - Balanced Bowls

Twin Mycroy^R bowls on 12-inch centers.

Mean-Time-Between-Failure In excess of 100,000 hours.

Operating Features

Cooling Convection, no fans or moving parts

Ambient Conditions

Operating: -50°C to +50°C; Up to 100% R.H.; Storage: -50°C to +80°C

Primary Power Passive device. No external power is required.

Size and Weight 20W x 14D x 20.5H inches, 80lbs

(50.8W x 35.6D x 52.1H cm, 36.4Kg)

Shipping cube approximately 16 cu.ft. Shipping weight approximately 170 lbs.

Mounting Crossbar with heavy-duty straps.

Special Features

Safety External spark gap for protection against static charges and lightning.

Components and Construction Totally solid state transformer assembly, mounted internally to a reinforced fiberglass case that is sealed for protection against the environment. External hardware is stainless steel.

1.4 TRC Product Group

TRC-500	HF Transmitting Antenna Coupler, 500W
TRC-3.5K	HF Transmitting Antenna Coupler, 3.5KW
TRC-5K	HF Transmitting Antenna Coupler, 5KW
TRC-10K	HF Transmitting Antenna Coupler, 10KW
TRC-20K	HF Transmitting Antenna Coupler, 20KW

Unbalanced Connector Assembly Options:

	Operation:	50-ohm	70-ohm
BN connector	(Note 1)	/283-1	/283-3
BNC connector	(Note 1)	/284-1	/284-3
C connector	(Note 1)	/286-1	/286-3
HN connector	(Note 1)	/285-1	/285-3
N connector	(Note 1)	/259-1	/259-3
QDS connector	(Note 1)	/289-1	/289-3
1-5/8 inch EIA flange	(Note 2)	/272-1	/271-1
LC -type connector	(Note 3)	/287-1	/287-5
QDL-type connector	(Note 3)	/273-1	/273-3
3-1/8 inch EIA flange	(Note 4)	/501	/701
3-1/8 to 1-5/8 adapter	(Note 4)	/278	/279
RG85/U flange	(Note 5)	/274-1	/274-3

Note 1 Model TRC-500 only.

Note 2 Models TRC-3.5K and TRC-5K

Note 3 Models TRC-500, TRC-3.5K and TRC-5K

Note 4 Model TRC-20K only.

Note 5 Model TRC-5K only.

To order, specify both model and option. Example: TRC-20K/501.

Section 2 - Installation

2.1 Initial Inspection

2.1.1 General

The TRC-20K is shipped in one container and is completely assembled at the time of delivery from the factory. Every TRC-20K undergoes a thorough testing prior to shipment. Upon receipt of the unit, check the packing case and its contents for obvious damage. Unpack the equipment carefully to reduce the risk of damage and to avoid misplacing any parts shipped as loose items. See Table 2.1 for a list of the loose items.

2.1.2 Damage By Carrier

With respect to equipment damage for which the carrier is liable, TMC will assist in describing methods of repair as well as furnishing replacement parts.

2.2 Electrical Installation

2.2.1 General

Each unit has been factory tested and arrives ready for immediate installation and operation. No preliminary adjustments are necessary.

2.2.2 Mounting

The TRC-20K is designed for either pole or wall mounting. For pole mounting, two mounting straps and the necessary lag bolts are provided. For wall mounting, four mounting brackets attached to the unit case are used. Figure 2.2 illustrates the necessary outline and mounting dimensions of the TRC-20K. Figure 2.1 is a schematic illustration of a typical rhombic antenna system in conjunction with the TRC-20K.

2.2.3 External Antenna Connections

The two antenna input leads are connected to the two insulator bowl terminal connectors of the TRC-20K. These bowls are located on the top side of the TRC case.

2.2.4 External Coaxial Connections

The coaxial lead-in cable is connected to the TRC-20K RF connector assembly located on the bottom of the case.

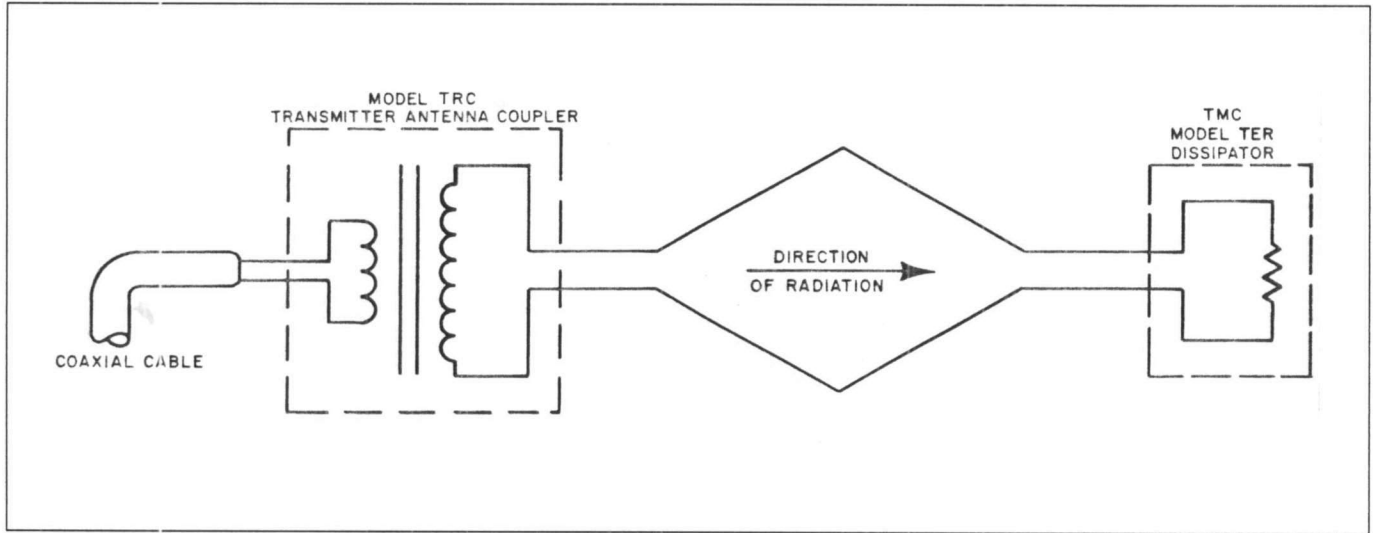


Figure 2.1 Schematic Diagram, Typical Rhombic Antenna System

2.3 Performance Check

2.3.1 General

When the appropriate RF connections to the antenna and the coaxial lead-in cable have been made, the TRC-20K is ready for use. No further steps are required.

Table 2.1 - Loose Items Supplied

Item	TMC Part Number	Description	Quantity
1	SC111	Lag Bolt	8 each
6	FW50HBN	Flat Washer	8 each

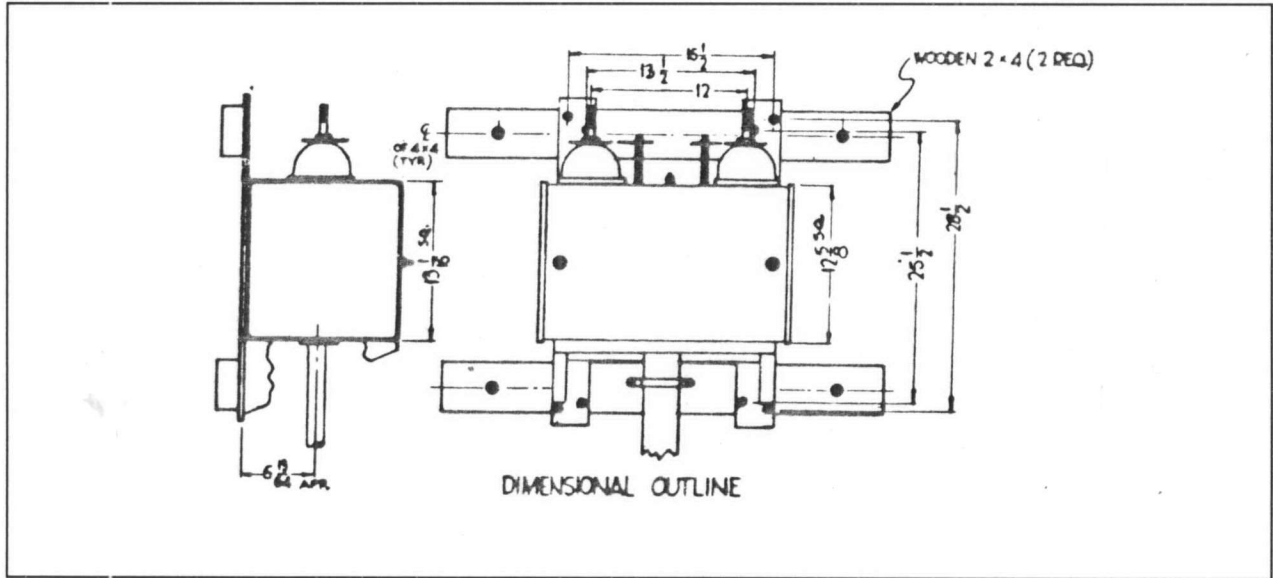


Figure 2.2 Outline Drawing with Mounting Dimensions

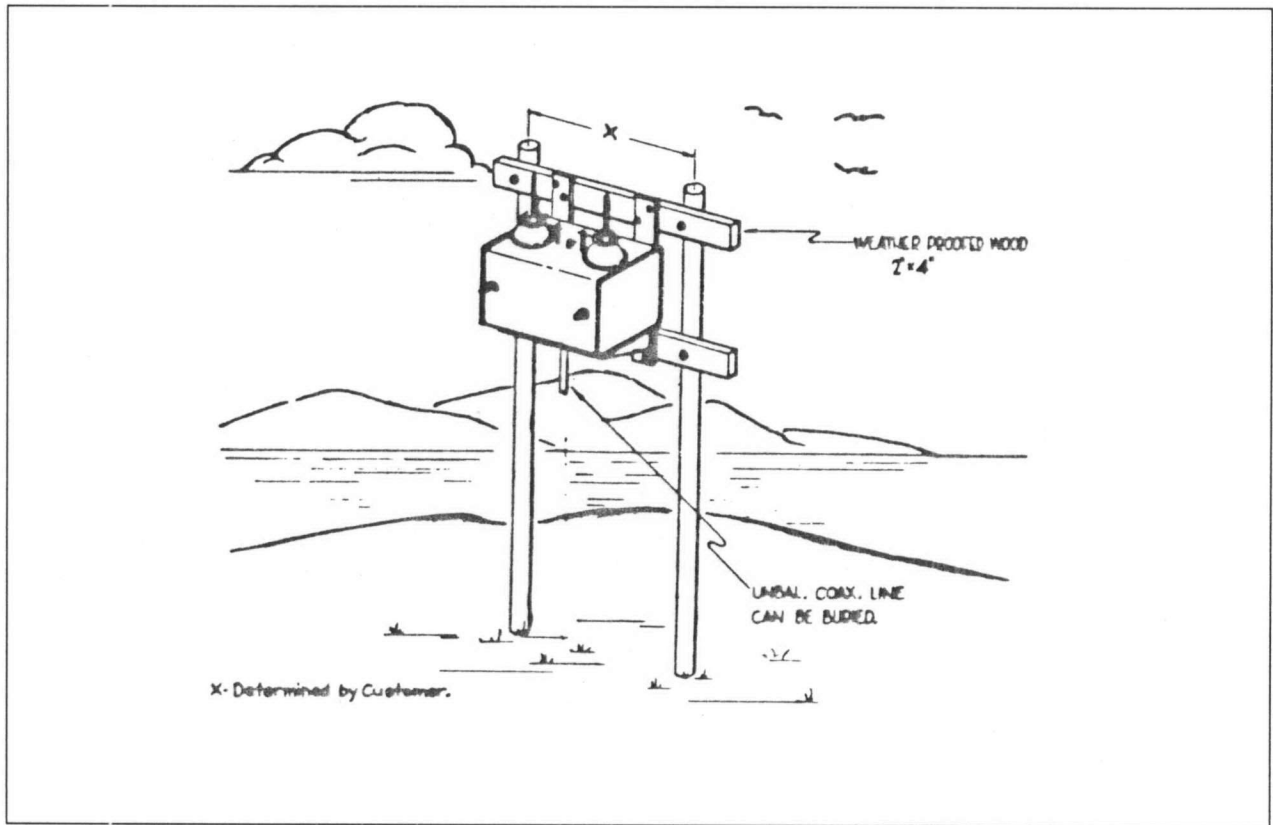


Figure 2.3 Recommended Pole Mounting

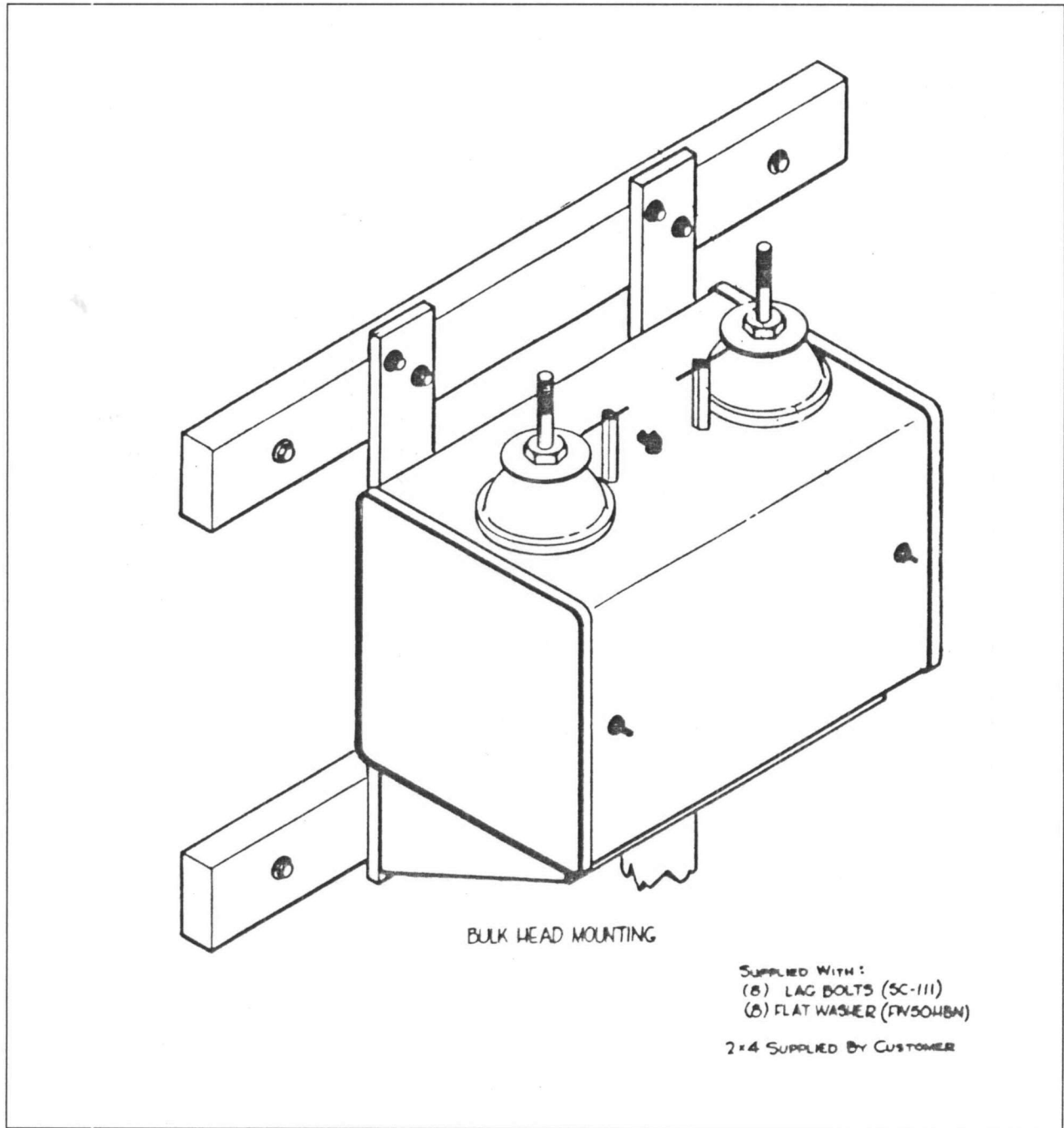


Figure 2.4 Recommended Bulkhead Mounting

Section 3 - Operation

3.1 General

After connecting the antenna leads and coaxial lead-in cable, as described in **Section 2 - Installation**, no further operating procedures are required. The TRC-20K is now fully operational without further adjustment.

Section 4 - Maintenance

4.1 General

Due to the simplicity of construction and design of the TRC-20K, maintenance may simply consist of looking for secure connections and unit cleanliness.

4.2 Preventive Maintenance

4.2.1 General Cleaning Methods

Preventive maintenance for the TRC consists of routine functions such as visual inspection and cleaning. Periodic cleaning is recommended as dust may build up on components, reducing the efficiency of the coupler unit and possibly causing circuit failure. To facilitate cleaning the unit, use a vacuum cleaner or a low-pressure filtered compressed-air supply.

4.2.2 Visual Check

A simple visual check of the unit when it is opened up for servicing or cleaning will often reveal potential trouble spots and thereby reduce downtime due to component failure. Signs of trouble may be found in discoloration, warped printed circuit boards and damaged wiring or cables. Any deteriorating component should be replaced immediately. All hardware should be checked for tightness during preventive maintenance inspections.

4.3 Troubleshooting

4.3.1 General Failure Symptoms

During operation of the TRC, the following failure symptom may be observed:

No signal output or weak signal to the antenna system.

Possible Cause: Transmitter failure (Output affected)

Remedial Action: Refer to transmitter or transceiver manual

Possible Cause: Interconnection, coupler to transmitter

Remedial Action: Check the RF coaxial cable between the transmitter and

Possible Cause: Interconnection, coupler to antenna

Remedial Action: Check the twin RF leads between the coupler and the antenna.

Possible Cause : Antenna fault

Remedial Action: Check for a fault in the antenna system. Make certain all of the RF connections are securely fastened.

5.4 Repair

Repair work generally consists of replacing the defective component. The following cautions should be observed:

- Make sure the replacement component is an exact duplicate of the defective one.
- Place any new component in the same location as the component it replaces.

The TRC-20K is unique in that only one electrical assembly is used. Other than external components such as the spark gap protection assemblies and the hardware, repair is rarely needed. In the event the internal transformer fails - a direct lightning hit would do it - the case may be opened and the entire assembly replaced. Factory repair of the TRC-20K is also available directly from TMC.

Section 5 - Parts Lists

Table 5.1 Replacement Spare Parts List

Item	TMC Part Number	Description	Quantity
1	NS123	Insulator Flanged Bowl	2 each
2	PM723-2NR	Spark Gap Contact, Round	2 each
3	GA139	Outer Gasket	2 each
4	PM724-1NR	Spark Gap Contact, Rod	2 each
5	PM721-2NR3.125	Spark Gap Post	2 each